



# Fact Sheet

United States Nuclear Regulatory Commission

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## Uranium Mill Tailings

### Background

In the early 1980's, the price of uranium fell due to a lack of orders for new nuclear power plants in the U.S. and the importing of uranium from other countries. As a result, U.S. uranium mills were shut down or had their operations scaled back. The price of uranium is still depressed and many previously operated mills have cleaned or are cleaning up (decommissioning) waste resulting from extracting uranium from ore (the only U.S. thorium mill was remediated under the direction of the State of Illinois, an Agreement State). This waste, primarily mill tailings (sandy ore residue), poses a potential hazard to public health and safety. Uranium mill tailings contain the radioactive element radium, which decays to produce radon, a radioactive gas. The radium in these tailings will not decay entirely for thousands of years.

To provide for the disposal, long-term stabilization and control of these mill tailings in a safe and environmentally sound manner and to minimize or eliminate radiation health hazards to the public, Congress enacted the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). This Act established two programs to protect the public and the environment from uranium mill tailings.

The UMTRCA Title I program established a joint Federal/State-funded program for remedial action at abandoned mill tailings sites where tailings resulted largely from production of uranium for the weapons program. Now there is Federal ownership of the tailings disposal sites under general license from the Nuclear Regulatory Commission (NRC). Under Title I, the Department of Energy (DOE) is responsible for cleanup and remediation of these abandoned sites. The NRC is required to evaluate DOE's design and implementation and, after remediation, concur that the site meets standards set by the Environmental Protection Agency (EPA).

The UMTRCA Title II program is directed towards uranium mill sites licensed by the NRC or Agreement States in or after 1978. Title II of the Act provides:

1. NRC authority to control radiological and non-radiological hazards.
2. EPA authority to set generally applicable standards for both radiological and non-radiological hazards.
3. Eventual State or Federal ownership of the disposal sites, under general license from NRC.

There are four Agreement States --Colorado, Illinois, Texas, and Washington-- that license “Atomic Energy Act section 11e.(2)” material (i.e., certain mill tailings and related waste containing thorium or uranium). The State of Utah has submitted an application to amend its current Agreement to include authority to license section 11e.(2) material. NRC is required to make a determination that all applicable standards and requirements have been met by uranium mills before termination of their Agreement State license.

## **Regulations and Standards**

UMTRCA charged the EPA with the responsibility for issuing generally applicable standards for control of uranium mill tailings. In 1983, EPA issued standards for both Title I and Title II sites. In November of 1985, as mandated by UMTRCA, NRC changed its regulations in 10 CFR Part 40, Appendix A, to be consistent with EPA Title II standards. Since 1985, various changes have been made to Part 40 for the Title II sites. In 1995, EPA issued final Title I ground water standards.

## **Discussion**

**Title I -- Reclamation Work at Inactive Tailings Sites** - Under the Uranium Mill Tailings Remedial Action (UMTRA) Project, DOE was charged with completing surface reclamation at 24 inactive uranium mill tailings piles. Two sites in North Dakota were withdrawn and tailings from some sites were combined, resulting in 19 tailings disposal sites. These piles range in size from approximately 60,000 to 4.6 million cubic yards of material. Except for a site at Canonsburg, Pennsylvania, and an associated property at Burrell, Pennsylvania, the inactive sites are located in western states.

In 1993, DOE became a licensee of NRC under the general license provisions of 10 CFR 40.27. This means NRC concurred in the completion of construction and surface cleanup at the Spook, Wyoming, inactive tailings site, and accepted DOE's plan for long-term surveillance at the Spook site. By August 1999, 17 more sites were completed and brought under the general NRC license, including sites at Ambrosia Lake, New Mexico; Burrell, Pennsylvania; Canonsburg, Pennsylvania; Durango, Colorado; Falls City, Texas; Green River, Utah; Gunnison, Colorado; Lakeview, Oregon; Lowman, Idaho; Maybell, Colorado; Mexican Hat, Utah; Naturita, Colorado; Rifle, Colorado; Salt Lake City, Utah; Shiprock, New Mexico; Slick Rock, Colorado; and Tuba City, Arizona. The only remaining site is the Grand Junction, Colorado site. Legislation allows a portion of that site to remain open until 2023 to accept additional waste from tailings contaminated properties.

DOE initiated the ground water cleanup phase of the UMTRA Project in 1991. It has completed all of the 20 scheduled baseline risk assessments for the ground water cleanup phase and has transmitted them to concerned parties. Two sites did not have ground water contamination. DOE has developed Ground Water Compliance Action Plans for demonstrating ground water

compliance at 13 sites and submitted them to the NRC for concurrence. DOE has demonstrated ground water cleanup compliance at eight of those sites.

**Title II -- Licensed Uranium Recovery Facilities and Mill Tailings Sites** - Of 24 uranium recovery facilities currently licensed by the NRC under its regulations (10 CFR Part 40), there are 18 conventional uranium mills and 6 in-situ leach (ISL) facilities. In addition, there is one mill tailings waste disposal facility. Two of the conventional mill site licenses have been terminated and the reclaimed tailings areas transferred to DOE for long-term care under the general license provisions of 10 CFR 40.28.

A conventional mill uses uranium ore extracted by either open pit or deep mining. The ore is then crushed and sent through a mill, where extraction processes concentrate the uranium into uranium-oxygen compounds called yellowcake. The remainder of the crushed rock, in a processing fluid slurry, is placed in a tailings pile/cell. The "pile" is actually a constructed impoundment or a former uranium mine pit that must meet criteria in 10 CFR Part 40, Appendix A. These criteria include requirements for siting and design of the pile, cover performance, and financial surety for decommissioning, reclamation, and long-term surveillance.

With the ISL uranium extraction process, wells are drilled into rock formations containing uranium ore. Water, with added oxygen and sodium bicarbonate, is injected down the wells to mobilize the uranium in the rock so that it dissolves in the ground water. The water is pumped to the surface, where a processing plant separates the uranium. Waste from this process are disposed in a tailings pile at a mill site.

Only one NRC-licensed conventional uranium mill is operating. One other mill is on stand-by status and may resume commercial operation in the future. Most of the conventional uranium mill sites have completed, or are completing, reclamation activities to provide long-term stabilization and closure of the tailings impoundments and the sites. Three of the six ISL facilities are presently operating, one is on stand-by status, one is decommissioning, and the other facility has not been built yet. The NRC inspects these sites at semiannual to 3-year intervals depending on the operational (or stand-by) and reclamation status.

The NRC-licensed sites are located in Nebraska, New Mexico, Utah, and Wyoming. There also are seven conventional uranium mills in Agreement States that have similar non-operational tailings impoundments. One mill in Colorado is operating. Texas also has ISL facilities, but most are in, or have completed, decommissioning.

The mill tailings waste disposal facility, operating in northwestern Utah at South Clive, was licensed as a commercial facility in November 1993 to receive and dispose of 11e.(2) byproduct material. The site also has disposal cells licensed under Utah Agreement State Authority, for the disposal of low-level radioactive waste and mixed waste.

In 1991, NRC and EPA entered into a Memorandum of Understanding (MOU) to eliminate the dual regulation by EPA under the Clean Air Act and the NRC under UMTRCA. The MOU ensures that non-operational uranium mill tailings piles will be closed to comply with the radon release (flux) standards as expeditiously as practicable, with a goal that such closure occur by the end of 1997.

For reasons beyond the control of the licensees, the 1997 closure goal was not met for 13 sites. Reasons for not meeting the goal include greater time than planned needed to clean up ground water, controversy at one site causing delays in the design review, incomplete settlement of the tailings such that the radon barrier could not be put in place, and major design changes proposed by licensees to provide for more rigorous designs.

At the end of 2002, a final radon barrier (pile closure) had been placed on most of the tailings piles, with interim radon barriers still in place at the remaining sites (some sites have two or three disposal cells/piles).

The MOU also specifies that schedules for closure be enforceable by NRC or the affected Agreement States, and that the dual regulation of operational sites be addressed. Both NRC and EPA revised their regulations to eliminate the dual regulation that existed for closed uranium mill tailings piles. The NRC is continuing discussions with the EPA on ways to improve the efficiency of regulation at operating uranium recovery facilities.

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